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ABSTRACT

The author discusses the question of whether problems during infancy associated with organic impairment are substantially different from those related to social-emotional deprivation. Five factors which have a significant impact for both organically impaired and environmentally deprivated infants are addressed: prenatal intensive care, very early diagnosis, objective prognostic criteria, and infant-parent enrichment programs. Tables are provided on early signs of spastic cerebral palsy, feeding difficulty, and behavior disturbance. Four case reports of babies provided with guidance through a home enrichment program illustrate key issues in the management of high risk infants. (SBH)

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EARLY SIGNS OF ORGANIC SYMPTOMATOLOGY IN HIGH-RISK INFANTS

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Are the problems during infancy associated with organic impairment substantially different from those related to social-emotional deprivation? Such a question was posed at a recent conference.* The answers are complex but of sufficient pediatric interest to warrant discussion.

First, the issue of organicity must be dealt with. In adult neuropsychiatry, the term "organic" suggests progressive psychiatric symptomatology resulting from a disease which causes irreversible brain damage. (1) In infants, "organic" implies a biological basis for central nervous system maladaption which is intensified by environmental mismanagement. The symptoms and findings generally reflect the acute or chronic effects of anoxia and/or trauma, occasionally genetic or metabolic disturbance.

The organic problems appear in the form of delayed development, sensory-motor and cognitive lags, feeding and sleeping difficulty, seizures or disturbances of levels of consciousness, and behavioral instability associated with irritable temperament, episodic bouts of overactivity, perseveration and mood swings. (2)

In contradistinction to organic adult problems, if properly treated the signs and symptoms of babies are often reversible unless the damage is severe.

*Presented in part at the Training Institute of the Center for Clinical Infant Programs, Washington, D.C., December 6, 1979

In large measure, the reduction of the symptoms depends upon the ability of parents to cope with the excessive demands of a baby never anticipated to behave in this manner. Unless efforts are made to show them "how", the outcome of the organically impaired baby will be in jeopardy.

A word of warning--the presence of high risk factors do not necessarily guarantee the development of a disability nor predict its severity. (3) It is important for parents to realize that impaired but restored function will never be as skilled as nature intended. The larger the number of associated disabilities, the lesser the chances for optimal normalization. (4)

Favorable outcome will often depend upon the proper mixture of genetic, perinatal, and socio-environmental factors coupled with good general health care and appropriate mother-infant interactions. Experience teaches that high motivation imposed by realistic, supportive and determined parents who impose structure and avoid overprotection provide the infant with the best formula for later success.

Neurologically intact babies who are reared in a deprivating environment will either withdraw or demonstrate vigorously against it. Passivity, lethargy, seriousness, lack of interest in play objects, rejection of attempts at communication and failure to thrive are at one extreme and rocking, hair pulling, irritability, excessive crying and tantrums are at the other end. In contra-

distinction to the organically impaired baby, responsiveness will occur spontaneously when placed in a warm and supportive environment. An immature or inadequate parent or parents often are unable to provide the necessary ingredients to restore the baby's sense of well-being unless they receive intensive and long term psychiatrically-oriented therapy. (5)

Factors Influencing Outcome

The factors listed have a significant impact upon outcome for both organically impaired and environmentally deprivated infants. They are:

1. Perinatal intensive care
2. Very early diagnosis
3. Objective prognostic criteria
4. Infant-parent enrichment programs

Perinatal Intensive Care:

The incidence and severity of organic developmental disabilities is decreasing due to a combination of prevention and meticulous perinatal management. (6) The incidence of cerebral palsy has dropped from 0.7% (7/10,000 cases) in 1947 to 0.2% (2/10,000 cases) in 1979 and the highest risk babies weigh under 2000 grams. (7)

The causes are changing, and neonatal infections and brain trauma are replacing maternal and obstetrical complications. These complications reflect the problems associated with very low birth weight infants. (6) The trend is for a lesser number with

major C.N.S. deficits and a higher number with IQ's above 90. (8)

There also is a changing picture in the deprivational group as a result of the rising incidence of social situations that are not conducive to healthy child rearing. Amongst the unfavorable factors are teenage pregnancy, unmarried mothers with interests other than child rearing, infant battering arising from parental inadequacy and working mothers who utilize noncaring alternative care providers in nonstimulating environments. Some parents themselves coming from broken homes appear to perpetuate the same unfavorable patterns of child rearing they rebelled against.

Very Early Diagnosis:

Most organically stressed newborns are hyperexcitable with stress but some are apathetic. Most hyperexcitable babies develop spasticity and associated seizure disorders and/or hyperkinetic behavior problems, while those with apathy often are later classified as hypotonia and delayed development. However, in each group a small number resolve to normalcy or are left with residuals leading to later learning difficulty. (9, 10)

Nelson and her associates, utilizing the National Perinatal Collaborative Study Data, were able to correlate findings during the neonatal period with the later development of cerebral palsy. Amongst the findings were the presence of nystagmus and cataracts, abnormal head shape and myoclonic jerking significantly increased the risk for cerebral palsy, as did seizures and apneic spells, feeding problems and abnormal cry and activity level. At four months, poor or inconsistent muscle tone, and especially excessive

spontaneous writhing movements of the limbs were strong predictors of later cerebral palsy. (11,12)

This information can help to influence the physician to treat early signs and symptoms promptly, and to lessen the "let's wait and see"attitude which antagonizes parents.

Table 1 outlines some early signs of developing spasticity, the most common form of sensory-motor impairment. (13)

Feeding problems comprise a significant component of the factors which contribute to early infant and parent distress. Table 2 presents neurological findings which are associated with feeding difficulty. (13)

Although the environmentally-deprivated infant may demonstrate similar behavioral attitudes, generally the neurological findings are not present unless the cause is a mixed one. Early the deprivated baby fails to demonstrate excessive motility upon stimulation, and ganerally refuses to eat rather than trying and failing because of neurological limitations.

Prognostic Criteria:

Early useful prognostic information can be obtained from the status of the postural reflexes and developmental testing.

Postural Reflexes: Normally, seven postural reflexes which are considered critical to early sensory-motor development resolve between three and six months, and the protective (parachute) reflex, necessary for efficient walking, will emerge between the sixth and eighth month.

Capute and his associates have developed a system of grading which lends itself to quantitative analysis. (14)

These seven reflexes are:

1) The Moro reflex

2) The asymmetric tonic neck reflex

3) The symmetrical tonic neck reflex

4) The tonic labrynthine reflex

5) The derotational righting reflex

6) The positive supporting reflex

7) The Galant reflex

There is a relationship between the persistence of postural reflexes, the onset of walking and the types of cerebral palsy. Molnar's data shows that a child with cerebral palsy will not walk if by two years of age he cannot sit unsupported and if three or more primitive reflexes persist. (15)

These reflexes will be either intact or mildly delayed in the deprivational types.

Developmental Schedules: The failure to maintain a reasonably appropriate developmental schedule as measured by standard instruments such as the modified Gesell, theBayley, the Rosenblith, the Brazelton or the Denver tests, suggests future neurodevelopmental problems in selected areas or globally. Knoblich utilizing a parent questionnaire in conjunction with a revised Gesell developmental schedule can identify abnormality in very high risk infants from 28 weeks onward. (16)

The use of objective developmental criteria not only permits a more accurate diagnosis and prognosis, but it helps the physician to plan a realistic long-range management program which will include attempts to modify or correct disturbing complaints.

The deprivational baby will probably lag in many areas on developmental testing. However, there will be a positive response over a period of months when the environment changes to one of stimulation and innovation. The evidence is clear that such infants are "pseudo-retarded" and can rebound if exposed early to enriching experiences. (17)

Sensory Deprivation:

Deprivation in many forms does occur in both groups. In the organically impaired, it is the consequence of impaired and disruptive nerve pathways which prevent a normal adjustment to socialization. One theory suggests that the symptoms are the reflection of a disassociation between the higher cortical centers and the lower limbic-mid brain centers due to dysfunction of the reticular activating system. (18) The deprivated infant may have an anatomically intact neuronal transmission system but overutilizes catacholamine as a result of his frustrations, depression or anger. (19) Often it is difficult to differentiate behaviors of the two groups. Table 3 outlines the problem areas that lead to emotional problems in both types of babies.

New concepts, presented by Kandel, on the interrelationship between neuronal efficiency and social deprivation may eventually help to improve the limitations imposed by organicity. (20) Hubel and Wiesel recently reported that when the eyelids of one eye in kittens were sutured tight, the ensuing visual deprivation caused regression of neuronal development in the area of the cortex represented by the impaired visual input. However, the cortical area receiving normal visual input widened to suggest neuronal stimulation and growth in the unaffected cortex to compensate for the lack of bilateral visual input. (21)

These studies help to fortify the clinical experiences of many pediatricians who have found improvement over a period of months or years in a handicapped child when none had been anticipated. Now the suggestion that in a growing brain an associated area can take over impaired function must be regarded more seriously. (22)

Management Programs

If the thesis is that organic and deprivational problems are the result of intertwining of genetic, biologic and/or environmental factors, then the medium to influence outcome is the management program.

Early Management:

Prevention may eliminate or reduce the need for early management. While the classical approach is through medical, sociological and economic resources, education in the management of self and of marriage is also a critical issue.

Home Enrichment Programs:

When disability strikes a family, the consequences often emerge with only subtle warning signs. Normally mature sensory-motor capability is reached by 30 months but most parents have learned to expect variations in developmental milestone achievement and are not overly concerned with mild delays. They often fail to realize that in addition to the genetic timetable experiences in movement and learning also contribute to normal development. It may only be in retrospect that they recognize the impaired baby had shown signs of limitations in these areas.

Therefore most parents of organically impaired infants will need very explicit and appropriate directions in early enrichment techniques because many, especially in babies with minor impairments, will not be convinced of the need early. The program must be comprehensive, provide meaningful health care, fulfill the needs of both the infant and the family, be inter- and trans-disciplinary in nature and so designed to teach the parents to serve as the primary programmer and care taker. (23, 24)

Standard comprehensive treatment will include:

Medical management - good general health care especially diet, seizure control, and parent support.

Sensory-Motor Therapy - to show parents how to help the infant move, to overcome a fear of body position in space, and to explore the environment.

Feeding Management - to instruct parents in a proper feeding technique to help compensate for difficulty in sucking, chewing, or swallowing. Such instruction will lessen infant-parent anguish, improve nutrition, and lead to better communication and emotional status.

Emotional Support - the parents will need help to cross over from stages of grief and anger to levels of productivity. The baby will need enrichment experiences, behavior structure, and confidence. (5, 23)

Discussion

In a brain-damaged infant the genetically monitored developmental time table is interfered with by the persistence of primitive reflexes which prevent the emergence of normal patterns of sensory-motor functions, feeding, speech and language. The infant cannot attain an upright position or maintain it if he does if the righting and equilibrium reflexes fail to resolve. Consequently the infant becomes "locked" into ineffectual postures or positions.

The principle behind a modern infant-parent home intervention program is to provide help to the parents so that they can learn to use methods that will compensate for such developmental disruptions and the bilateral emotional frustrations that are part of these situations.

The pediatrician must accept some responsibility for the parental aggravation that invariably accompanies the growing up of an organically impaired infant. The case records which follow attest to the delays in providing early supportive services.

All of the early management needs can be provided within a well-designed parent-infant home enrichment program. The infant is exposed to developmentally appropriate, sequential and enriching experiences which help to develop self-sufficiency through a variety of approaches designed to stimulate exploration and experiences. Parent-infant interactions are improved through sensory/motor stimulation and feeding and language techniques. The goals are to improve performance and interpersonal relationships.

Studies show that when such an approach is used, social-emotional development outstrips progress made in sensory-motor skills and language. (24)

Kandel has demonstrated that brain plasticity can occur in the young. Boredom can lead to habituation which decreases neuronal synaptic efficiency and eventually producing neuronal inactivation. On the other hand, sensitization or stimulation can reverse the deprivating process and increase the neuronal transmission rate through catacholamine modulation. Such findings suggest that therapies must never be "never changing" and that unique and interesting approaches must be made in the management agenda. Deprivated neurons can be stimulated to compensate, thus improving the organic complex. These findings of the effects of habituation and sensitization upon the brain help to provide a neurological explanation for social-emotional, motor and cognitive improvement in both the neurologically-impaired and the deprivated infant.

The "new" morbidity refers to developmental, behavioral and learning problems. Both organically and environmentally deprived infants provide the future case load, with the implication being that the socio-environmental group will increase as the organic group is reduced. Early management requires similar methods although the emphasis will vary from infant to parents depending upon the cause and the intensity of the problem. In order to properly treat the increasing numbers of adjustment problems, the concerned pediatrician will develop a knowledge of the methods used in very early diagnosis and treatment of these conditions.

Summary

1. The behavioral manifestations of organically impaired and socially-emotionally deprived infants can be similar but persistence of infantile neurodevelopmental patterns serve to differentiate between the two groups.

2. Early identification leads to early programming which may help reverse the patterns of delayed development.

3. Enrichment techniques involving both parents and infant are the best way to bring about changes in function.

4. Early referral permits the infant to adjust to disability, whether caused by organic or environmental factors, and helps the parents to understand, accept and assume a responsible role in the habilitative process.

EARLIEST SIGNS OF SPASTIC CEREBRAL PALSY

BODY POSITION

PRONE -	HYPERTONUS; REFLEXES EXAGGERATED
SUPINE -	MOVEMENTS AT REST, DIMINISHED
	AT PLAY, EXAGGERATED
SITTING -	RIGHTING AND EQUILIBRIUM REFLEXES PERSISTING
ERECT -	TENDENCY TOWARDS SCISSORING:
	UPPER LIMB FLEXION; FISTED HANDS;
	ABSENT PROTECTIVE (PARACHUTE) REFLEX

TABLE 1

EARLIEST SIGNS OF FEEDING DIFFICULTY

PHYSICAL	ORGANIC	ENVIRONMENTAL
ROOTING/TNR REFLEXES	PERSISTING	DISAPPEARING
SUCK-SWALLOW MECHANISM	WEAK; UNCOORDINATED	INTACT
LIPS-MOUTH	LIMITED MOVEMENTS	NORMAL
	HYPERSENSITIVE TO STIMULATION	HYPOSENSITIVE TO STIMULATION
TONGUE	THRUSTING EXCESSIVE	NORMAL

TABLE 2

EARLIEST SIGNS OF BEHAVIOR DISTURBANCE

DYSFUNCTIONS	ORGANIC	ENVIRONMENTAL
BODY SIGNALING	EXAGGERATED	PASSIVE
EYE CONTACT	ATTEMPTS	AVOIDS
SMILE	ASYMMETRIC	SYMMETRIC WHEN PRESENT
TEMPERAMENT	HYPERREACTIVE	HYPOREACTIVE
SLEEP	DISTURBED	RESISTANT
	2° TO POSTURING/ STARTLING	2° TO PHOBIA
EXPERIENCES	LIMITED	NO ATTEMPT

TABLE 3

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Case Reports

These case reports are selected to represent key issues in the management of high-risk infants. Each of the babies and their parents were provided with guidance through a home enrichment program. With one exception (case number 1), the pediatric referral was later than and parent anxiety higher than it should have been. It is essential for pediatricians to refer before they are certain of the diagnosis, because the availability of a support system early lessens complications, especially in the psychosocial area.

Case Number 1

Case Number 1 illustrates the problems associated with a developing mild spastic diplegia compounded by extremely high parental anxiety starting during the neonatal intensive care period.

A male infant (birth weight 1389 grams) with apneic spells and generalized convulsions during the first eight days. Intensive hospital care was provided for a three month period. At discharge mild hypertonia exacerbated by movement was noted, and a home enrichment program was initiated within a month. At 14 months, in spite of home therapy, scissoring of the lower limbs emerged, interfering with attempts to walk. At 36 months orthopedic surgery (calcaneal osteotomies and bilateral heel cord lengthenings) resulted in independent gait patterns. At 4½ years, the child is in a regular nursery school interacting normally with peers and adults.

The high level of parental concern which compounded the difficulties of the early management period dissipated as the child began to demonstrate his capabilities.

Problems	Problems Attenuated
1. Pediatrics - seizure control	Phenobarbital/Dilantin-until 4½ years
2. Orthopedic - gait impairment	Physical therapy;bracing;surgery
3. Therapies:	
Sensory-motor - persisting Moro, TNR reflexes increasing hypertonus inefficient purposeful play	Neurodevelopment techniques to facilitate postural reflex maturity Integrated body control experiences; play with toys of various textures, colors, sounds
Speech/language - choking on semi-solid foods	Demonstrated Mueller techniques (ref 23) between 4-12 mos.
4. Psycho-Social - intensified parental anxiety over prognosis	"Honest" and in-depth discussions by pediatrician and social work staff; desensitization over meaning of the term "cerebral palsy"

Case Number 2

Case Number 2 illustrates the complicating features of spastic quadriplegia, moderate, intensified by high parent concern with the child's inability to walk.

A male infant, the second of twins (birth weight 1644 grams) required neonatal intensive care for six weeks due to respiratory distress. He was passive until seven months when stiffening spells were reported. Also, he failed to achieve developmental milestones and parents became aggressively upset when at 26 months he showed

no progress in attempts to stand or walk. A period of searching for appropriate specialists to rectify the situation intensified the baby's separation anxiety and the parents' overprotectiveness.

A home enrichment program was started at 28 months for one year, followed by enrollment in a comprehensive preschool education program. At six years of age, after intensive parent guidance coupled with behavior modification to lessen the child's phobias, and following orthopedic intervention (bilateral heel cord lengthenings), he was being prepared for enrollment in a regular public school program.

Problems	Problems Attenuated
1. Pediatrics - help parents to accept the diagnosis	Firm direction, but supportive
2. Orthopedic - spastic equinus, fixed	Bracing; surgery
3. Ophthalmologic - esotropia	Patching
4. Therapies:	
Sensory-motor - persisting righting/ equilibrium reflexes; poor body awareness; poor balance inefficient eye-hand control	Bobath techniques to neutralize effects of postural reflexes Exposure to toys and various objects to facilitate needed skills
Speech - excessive drooling	Positive behavior reinforcement
Psycho-Social - infant separation phobia	Peer exposure; play therapy
parental aggression; overprotectiveness	Supportive family therapy
management of hyperactive twin	

Case Number 3

Case Number 3 illustrates the long-term outcome of mildly involved child with a spastic quadriplegia who received good management.

A female infant (birth weight 1700 grams) who was given standard perinatal care. After hospital discharge at six weeks, seizures, esotropia, inability to sit or be supported in the standing position were complicating features leading to a diagnosis of spastic quadriplegia, moderate, at 24 months. A home enrichment program was provided for two years followed by one year in a comprehensive preschool special education program. At six years of age, she was transferred to a resource room in a public school system and mainstreamed two years later. Currently in high school she has a minor gait impairment, an IQ over 110, and is an honor student who participates in many extra-curricular activities.

In retrospect, the parents report that the early home program helped them the most because it focused their efforts on essentials, while the support provided by the team lessened their concerns over outcome.

Problems	Problems Attenuated
1. Pediatrics - minor motor seizures	Mysoline for three years
startling with bouts of hypertonus	Valium for three years
2. Orthopedics - "scissoring"	Stretching; surgery (bilateral Achilles heel cord lengthenings)
3. Therapies:	
Sensory-motor - balance; fear of body changes; weak leg power; disassociated gait patterns; poor prehension and bilateral hand-eye ability	Active stretching and strengthening activities; activities to overcome fear of positional changes; tactile discrimination-play techniques; prehension grasp methods
Speech-Language - clumsy feeding skills	Adaptive feeding devices
diminished receptive language	"Listening" games with visual reinforcement
4. Psycho-Social - parent concerns	Parent education and support

Case Number 4:

Case number 4 is an example of a current problem - pseudo-developmental delay linked to economic overburdening of parents.

A firstborn male (birth weight 2700 grams) who is neither standing or walking at 19 months. Choking spells and refusal to chew or swallow characterized the early months. He sat unsupported at six months but first words were not reported until 16 months with little advances made since then. Unexplained bouts of night terror followed by passive behavior during the day were noted at 14 months.

Inquiry into family dynamics suggests a relationship between the baby's maturation and the family life style. Both parents are young, concerned but fatigued. In order to maintain a lower middle class life style, father works during the day and cares for the baby at night, while the mother works. Grandparents or other family are not available to help out.

A home management program contributed to independent ambulation and a normal language output within a three-month period.

Problems	Problems Attenuated
1. Pediatric - medical work-up	Negative
2. The Therapies:	
Sensory-Motor - normal gr ~s motor abilities disinterest in play activities	Exposure to High interest toys
Speech/Language - expressive language lag	Listening and talking games
3. Psycho-Social passivity;non-smiling infant concerned but overburdened parents	Peer exposure for infant For parents, supplied a family helper; helped to organize life styles